April 21, 1931. J. A. FORTUNE 1,801,419

COMPRESSOR FOR CORROSIVE GASES

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Fig. 1.

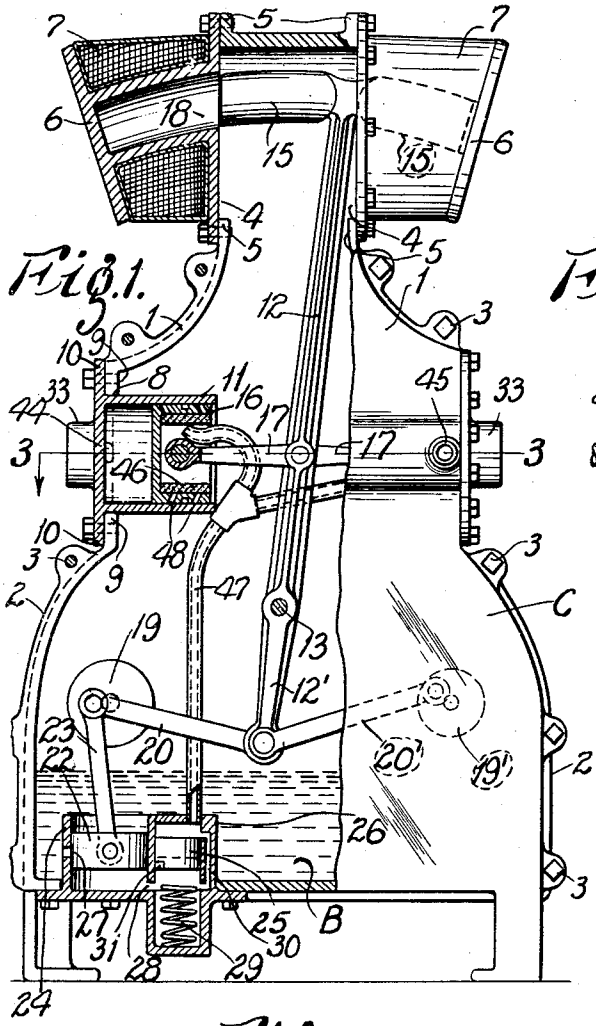


Fig. 2.

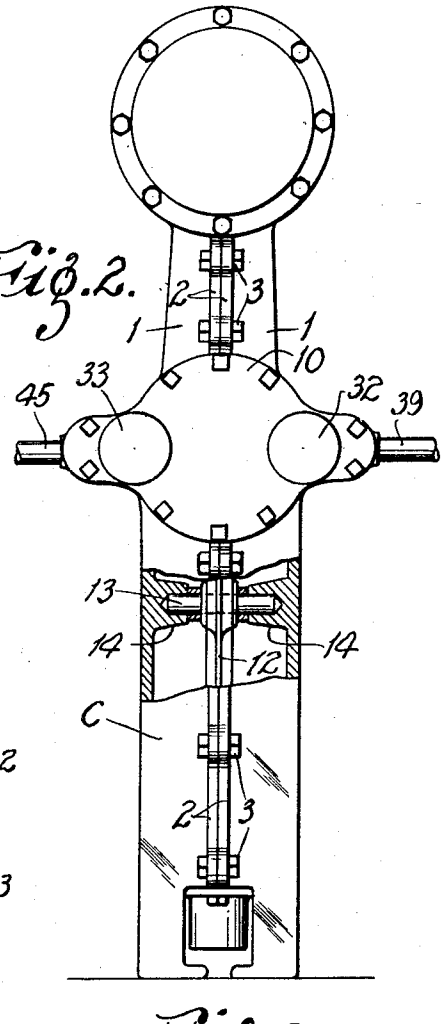


Fig. 3.

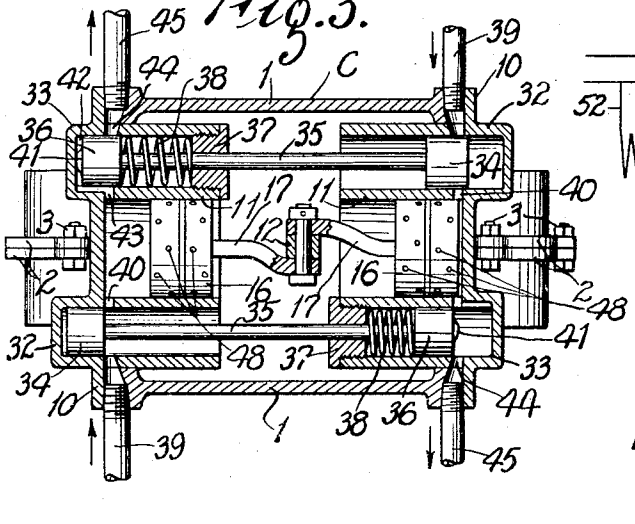
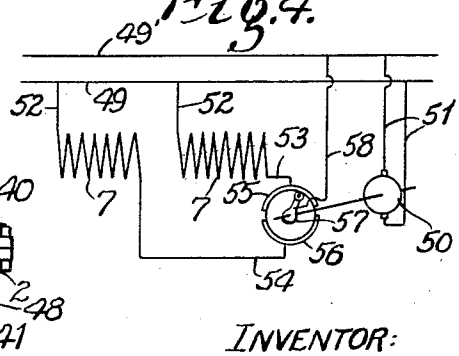


Fig. 4.



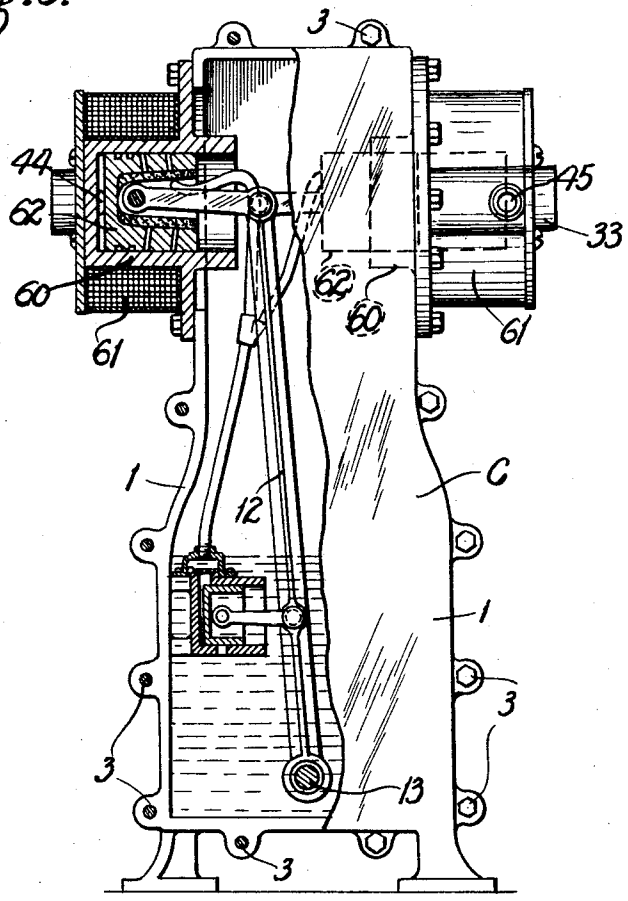
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Fig. 5.



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UNITED STATES PATENT OFFICE

JOHN A. FORTUNE, OF ST. LOUIS, MISSOURI, ASSIGNOR OF ONE-THIRD TO EDWARD SCHAAF, OF ST. MARYS, MISSOURI, AND ONE-THIRD TO DAVID E. WHITSON, OF ST. LOUIS, MISSOURI

COMPRESSOR FOR CORROSIVE GASES

Application filed July 9, 1930. Serial No. 466,691.

My invention has relation to improvements in compressors for corrosive, or noxious, gases and it consists in the novel features of construction more fully set forth in the specifications and pointed out in the claims.

Briefly, the invention is directed to compressors for use in refrigerating systems employing sulphur dioxide, or other gas having similar properties for making it available as a refrigerant.

The principal object of the invention is to arrange all the moving parts within the compressor case to avoid the necessity of providing stuffing boxes and packing around shafts. In the present types of compressors, whether reciprocating or rotary, difficulty is encountered in sealing the gas against escape from the compressor. Therefore, if the power for driving the compressor is obtained from within the compressor case this difficulty will be overcome. I have eliminated the disadvantages mentioned by operating the pistons from power generated by electro-magnets with movable armatures, the coils being outside the compressor case and the armatures inside. The specific manner in which I accomplish the objects sought as well as the advantages inherent in the invention will be better apparent from the detailed description of the invention in connection with the accompanying drawings, in which:—

Figure 1 is a combined side elevation and middle vertical longitudinal section of my improved compressor; Fig. 2 is a side elevation of the compressor with parts broken away; Fig. 3 is a horizontal cross-section taken on the line 3—3 of Fig. 1; Fig. 4 is a diagrammatic view showing the electrical connections for energizing the electro-magnets that operate the compressor; and Fig. 5 is a combined side elevation and vertical longitudinal section of a modified form of the invention.

Referring to the drawings, C represents the compressor case made in two identical sections 1, 1 each of which is provided with a flange 2 whereby they are bolted together by means of bolts 3. The sections 1, 1 are so formed as to have oppositely disposed flanged openings 4, 4 in their upper ends, on the flanges 5, 5 of which are bolted cores 6, 6 of high permeability for receiving the windings that constitute electro-magnets 7,7. At about the middle of the casing the sections 1, 1 are also provided with openings 8, 8 having inwardly extending flanges 9, 9 to which are bolted flanges 10, 10 of cylinders 11, 11 which extend into the casing. A crank-arm 12 is adapted to oscillate between cylinders 11, 11 for which purpose it is mounted on a crank-pin 13 disposed in hollow bosses 14, 14 projecting from the inner surfaces of sections 1,1 (shown in Fig. 2). At the upper end of crank-arm 12 are a pair of cylindrical members 15, 15 which are adapted to operate in and out of the adjacent cores 6, and thus function as armatures for the electro-magnets 7 which alternately attract the armatures so as to oscillate the crank-arm and, of course, effect a reciprocation of pistons 16, 16 in the cylinders 11, 11, said pistons being connected to the crank 12 by suitable connecting rods 17, 17. It will be observed that the armatures 15, 15 are arcuate as are also the sockets 18, 18 in the cores 6 so as to obviate the necessity of a pivotal connection between the connecting rod 12 and armatures 15.

The lower part of the casing C serves as an oil basin and the short arm 12′ of the crank 12 which operates therein is excentrically connected to a disc 19 by means of a link 20, and also to a disc 19′ by means of a link 20′. In the oil basin B is disposed an oil pump comprising a driving piston 22 connected to disc 19 by a connecting rod 23 and operating in a cylinder 24, and a floating piston 25 operating in a cylinder 26 integrally formed with cylinder 24. There is an oil inlet opening 27 and an oil outlet opening 28 in cylinder 24, and a spring 29 arrests the piston 25 in its downward movement so that it is arrested opposite the outlet 28. An oil by-pass 30 extends upwardly in the wall of cylinder 26 from just above the lower-most point of piston 25, when this piston is down, to the upper part of cylinder 26, and a recess 31 is provided in piston 25 to permit the oil pressure communicated through the discharge port 28 to start the piston 25 on its initial upward movement.

Each of the cylinders 11, 11 in which the gas is compressed is provided with intake and discharge valves which are identical for both cylinders so that a description of one intake and one discharge valve will be sufficient.

The valves for the compressor cylinders are of the piston type, and an intake valve of one cylinder cooperates with a discharge valve of the other. Thus, the intake valve chamber 32 of the right-hand piston 11 (Fig. 3) is opposite the discharge valve chamber 33 of the left-hand piston 11; and intake valve chamber 32 of the left-hand piston is also opposite discharge valve chamber 33 thereof. Piston valve 34, operable in chamber 32, is connected by a rod 35 to piston valve 36 operable in chamber 33. The valve chamber 33 is closed on its inner end by a plug 37 between which and piston 36 is a coiled spring 38 which exerts its tension on said piston to force it into the cylinder and close the valve. Each intake valve chamber receives the gas through an intake pipe 39 and each cylinder 11 receives the gas through port 40. Each discharge valve 36 has a small boss 41 on its head to maintain a clearance 42 so that compressed gas may traverse port 43 to enter chamber 33 to unseat said valve and open port 44 to allow the compressed gas to pass through pipe 45 into the refrigerating system.

Within each piston 16 is an oil pad 46 which is kept saturated by oil forced through pipe 47 by the pump piston 25. The skirt of the piston 16 is provided with perforations 48 to permit the oil to drain through and lubricate the cylinder 11.

The electrical connections necessary to effect the alternate operations of electro-magnets 7, 7 are illustrated in Fig. 4 and comprise line wires 49, 49′ to which are connected an electric motor 50 through the leads 51, 51. The windings of magnets 7, 7 are connected by wires 52, 52 to line wire 49 and by wires 53, 54 to contacts 55, 56. The contacts 55, 56 together with a rotating contact arm 57, connected by conductor 58 to line wire 49′, constitute a distributor which is directly connected to motor 50.

In Fig. 5, I show a modification of the invention wherein the compressor cylinders 60 also serve as cores for receiving the windings of electro-magnets 61, and the pistons 62 function as armatures so that separate armatures are dispensed with and the compressor simplified to this extent. The valve arrangement and the other parts of the compressor are the same as shown in the main form.

It is obvious that other changes may be made in the construction of the compressor, such as employing different types of valves and a different type of fuel pump without departing from the spirit of the invention.

Referring again to the principal form shown in Figures 1 to 4, the operation of the invention may briefly be described as follows:

We will assume that the necessary electrical connections and pipe connections for effecting a circulation of the refrigerant throughout the system have been made. The motor 50 is then started and through the action of the distributor, comprised in contacts 55, 56 and 57, the coil 7 on the right-hand side (Fig. 1) is energized to attract its armatures 15 and oscillate the crank-arm to the right. The right-hand piston will then be forced inwardly compressing the gas in the cylinder and unseating the adjacent discharge valve 36. The compressed gas is thus forced through pipe 45 into the refrigerating system. With this stroke of the crank-arm 12, the left-hand piston 16 is moved outwardly to suck gas into the cylinder 11 through port 40. This is possible because the port 40 has been uncovered by the outward movement of valve piston 34 through its connections with the opposite discharge valve piston 36. The distributor then causes the current to flow through the left-hand coil 7 to oscillate the crank-arm in the opposite direction and move the left-hand piston 16 inwardly to compress the gas in its cylinder. Just as soon as the left-hand piston 16 moves inwardly the opposite piston 16 moves outwardly and permits the right-hand discharge valve to seat under the tension of spring 38. The seating of this valve draws the opposite piston 34 in the intake valve chamber to the position in which it will close off port 40 permitting a compression of the gas in the left-hand cylinder 11 and a discharge of compressed gas through the left-hand valve into the circulating system. Thus compressed gas is forced into the system on every stroke of the crank-arm and low pressure gas drawn in for subsequent compression at the same time.

Having described my invention, I claim:

1. A compressor comprising a suitable casing, a crank-arm pivotally mounted in said casing, a cylinder adjacent to said crank-arm, a piston operable in said cylinder and connected to the crank-arm, an intake and a discharge valve for said cylinder, an electro-magnet on said casing, and an armature on the crank-arm adapted for actuation by the electro-magnet to operate said piston.

2. A compressor comprising a suitable casing, a crank-arm mounted for oscillation within said casing, oppositely disposed electro-magnets mounted in the casing, armatures carried by the crank-arm and adapted to cooperate with the electro-magnets for oscillating the crank-arm, means for alternately energizing the electro-magnets, oppositely disposed compression cylinders in said casing, pistons connected to the crank-arm

and adapted to operate in said cylinders, and means for lubricating the cylinders.

3. A compressor comprising a suitable casing, a plurality of cylinders within said casing, a piston operable in each of said cylinders, an electro-magnet associated with each cylinder and disposed on the outside of the casing, and means for intermittently passing an electric current through said magnets to alternately operate said pistons.

4. A compressor comprising a suitable casing, a crank mounted in said casing, a cylinder mounted on each side of the crank in said casing, a piston operable in each cylinder and connected to said crank, each cylinder having an intake and a discharge valve, and an electro-magnet associated with each cylinder for actuating the piston operable in said cylinder.

In testimony whereof I hereunto affix my signature.

JOHN A. FORTUNE.